AMENDMENTS TO THE CLAIMS

1. (original) A Raman amplifier, comprising:

an optical fiber that propagates and amplifies a second signal light that is a wavelength-multiplexed signal of a first signal light and a reference light, wherein the first signal light includes a plurality of wavelengths and the reference light is out of a wavelength range of amplification;

an excitation light source that outputs an excitation light for amplifying the second signal light;

a beam splitter that splits a portion of the second signal light into the first signal light and the reference light;

a signal light level detecting unit that detects a level of the first signal light;

a reference light level detecting unit that detects a level of the reference light; and

a signal level setting unit that, based on the level of the reference light, calculates a target value to control signal light level for constantly maintaining a Raman gain, and controls the output level of the excitation light in such a way that the first signal level matches with the target value.

2. (original) The Raman amplifier according to claim 1, wherein the signal level setting unit controls the output level of the excitation light in such a way that the target value Ps_on is calculated as:

$$Ps\_on = Ps\_off \times G \times (Pref / Pref\_init)$$

where, Ps_off is the level of the first signal light before being amplified, Pref_init is the initial

level of the reference light, Pref is the level of the reference light after the second signal light is amplified, and G is the Raman gain.

3. (original) The Raman amplifier according to claim 1, wherein the reference light is a monitoring control light that is employed in an optical transmission system.

4. (original) The Raman amplifier according to claim 1, further comprising:

a gain equalizer that corrects a wavelength-dependent gain profile of the amplified second signal light.

5. (original) The Raman amplifier according to claim 1, further comprising:

a rare-earth-doped optical fiber amplifier that amplifies the Raman-amplified signal lights, by a specific gain; and

a variable attenuator that attenuates a level of the signal light amplified by the rare-earth doped optical fiber amplifier to a desired value.

6. (original) The Raman amplifier according to claim 1, further comprising:

a reception light level sensing unit that, when the reference light level falls below a specific value, forcibly lowers the output of the excitation light below a specific value before the target signal level setting unit controls the excitation light source.

7. (original) An optical relay transmission system comprising:

a signal light transmitting unit that outputs a signal light that has a plurality of wavelengths, wavelength-multiplexes and transmits the signal light;

a reference light output unit that outputs a reference light of a wavelength that is out of a wavelength band of the signal light;

a Raman amplifier that amplifies, based on the reference beam, the wavelength-multiplexed signal light, wherein the Raman amplifier includes

an optical fiber that propagates and amplifies a second signal light that is a wavelength-multiplexed signal of a first signal light and a reference light, wherein the first signal light includes a plurality of wavelengths and the reference light is out of a wavelength range of amplification;

an excitation light source that outputs an excitation light for amplifying the second signal light;

a beam splitter that splits a portion of the second signal light into the first signal light and the reference light;

a signal light level detecting unit that detects a level of the first signal light;

a reference light level detecting unit that detects a level of the reference light; and

a signal level setting unit that, based on the level of the reference light, calculates a target value to control signal light level for constantly maintaining a Raman gain, and controls the output level of the excitation light in such a way that the first signal level matches with the target value; and

a signal receiving unit that receives the signal light amplified by the Raman amplifier.

8. (original) The optical relay transmission system according to claim 7, wherein a plurality of Raman amplifiers, including a first Raman amplifier and a last Raman amplifier, are cascaded in such a manner that the first Raman amplifier receives the wavelength-multiplexed signal light and the signal receiving unit receives the signal light amplified by the last Raman amplifier.

9. (new) A method of amplifying a light signal, comprising:

receiving a wavelength-multiplexed second signal light which includes a first signal light and a reference light, wherein the first signal light includes a plurality of wavelengths and the reference light is out of a wavelength range of amplification;

providing an excitation light for Raman amplifying the second signal light;

splitting a portion of the second signal light into the first signal light and the reference light;

detecting level of the first signal light;

detecting a level of the reference light; and

calculating a target value to control signal light level for constantly maintaining a Raman gain based on the level of the reference light, and controlling the output level of the excitation light so the first signal level matches the target value.

10. (new) The method according to claim 9, further comprising calculating the target value, Ps_on, as:

$$Ps\_on = Ps\_off \times G \times (Pref / Pref\_init)$$

wherein, Ps_off is the level of the first signal light before being amplified, Pref_init is the initial

level of the reference light, Pref is the level of the reference light after the second signal light is amplified, and G is the Raman gain.

11. (new) The method according to claim 9, wherein the reference light is a monitoring control light that is employed in an optical transmission system.

12. (new) The method according to claim 9, further comprising:

correcting a wavelength-dependent gain profile of the amplified second signal light.

13. (new) The method according to claim 9, further comprising:

amplifying the Raman-amplified signal lights, by a specific gain, using a rare-earth-dope optical fiber amplifier; and

attenuating a level of the signal light amplified by the rare-earth doped optical fiber amplifier to a desired value.

14. (new) The method according to claim 9, further comprising:

forcibly lowering the output of the excitation light below a specific value when the reference light level falls below a specific value, before controlling the excitation light source.